

## **Maxwell Pond Dam Removal/Black Brook Restoration Project Quality Assurance Project Plan (QAPP)**

**City of Manchester**  
**Parks Recreation & Cemetery Department**  
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Funding for this project was provided in part by a Watershed Assistance Grant from the New Hampshire Department of Environmental Services (NHDES) with Clean Water Act Section 319 funds from the United States Environmental Protection Agency (USEPA). The City of Manchester Parks Recreation & Cemetery Department provided the remaining funding.



January 9, 2008

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January 9, 2008

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Project Manager:

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Charles DePrima, City of Manchester

Project QA Officer:

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Jeffrey Tucker, DuBois & King, Inc.

Program Quality Assurance Coordinator:

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Signature / Date  
Jillian McCarthy, NHDES

NHDES Quality Assurance Manager:

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Signature / Date  
Vincent Perelli, NHDES

USEPA Project Manager:

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Signature / Date  
Warren Howard, US EPA Region I

USEPA QA Representative:

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Signature / Date  
Charles Porfert, US EPA Region I

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### A3 – Distribution List

Table 1 presents a list of people who will receive the approved QAPP, the QAPP revisions, and any amendments.

**Table 1: QAPP Distribution List**

QAPP Recipient Name	Project Role	Organization	Telephone number and Email address
Charles DePrima	Project Manager	City of Manchester, Parks Recreation & Cemetery Department	603-624-6565 Ext. 315 cdeprima@manchesternh.gov
Jonathan O-Rourke	Project Co-Manager	City of Manchester, Parks Recreation & Cemetery Department	603-624-6565 Ext. 313 jorourke@manchesternh.gov
Stephen Landry	NH DES Project Manager	NHDES Watershed Management Bureau	(603) 271-2969 slandry@des.state.nh.us
Jennifer Drociak	DO/Phosphorus Sampling QA Officer	NHDES Watershed Management Bureau	603-271-0699 jdrociak@des.state.nh.us
David Neils	Biomonitoring QA Officer	NHDES Biomonitoring Program Supervisor	603-271-8865 dneils@des.state.nh.us
Rachel Rainey	Laboratory QA Officer	NHDES Laboratory	603-271-2993 rrainey@des.state.nh.us
Vincent Perelli	NHDES Quality Assurance Manager	NHDES Commissioner's Office	603-271-8989 vperelli@des.state.nh.us
Jillian McCarthy	Program Quality Control Officer	NHDES Watershed Management Bureau	603-271-8475 jmccarthy@des.state.nh.us
Lori S. Siegel	Ecological Risk Assessor	NHDES Watershed Management Bureau	(603) 643-1218 lsiegel@des.state.nh.us
Jeffrey Tucker	Project QA Officer	DuBois & King, Inc.	802-728-3376 Ext. 1455 jtucker@dubois-king.com
Matthew Murawski	Project Field and Office Staff	DuBois & King, Inc.	802-728-3376 Ext. 1454 mmurawski@dubois-king.com
Daniel Moss	Project Field and Office Staff	DuBois & King, Inc.	802-728-3376 Ext. 1451 dmoss@dubois-king.com
Antonio Sanz	Project Field and Office Staff	DuBois & King, Inc.	802-728-3376 Ext. 1453 asanz@dubois-king.com
Warren Howard	USEPA Project Manager	USEPA New England	617-918-1587 Howard.Warren@epamail.epa.gov
Charles Porfert	USEPA Quality Assurance Representative	USEPA New England	617-918-8313 porfert.charlie@epa.gov
Mark Fausel	Sediment Analysis Laboratory Manager	Endyne, Inc. Laboratory Services	802-879-7103 Mfausel@EndyneLabs.com

Based on EPA-NE Worksheet #3

Please note that the DO measuring, water sampling/phosphorus analysis, and biological and habitat assessment components of this project are covered under other NHDES/EPA approved QAPPs.

### A4 – Project/Task Organization

#### **Project**

The objective of this project is to remove the dam and restore the immediate area of Black Brook in a manner that will be cost effective, will minimize the potential for future flooding at the dam, and maximize the restoration of Black Brook and associated aquatic habitat in the area. Quantitative

verification measures of project success will include Dissolved Oxygen (DO) concentration measurements, water sampling/phosphorus analysis, and biological community (fish assemblages) and habitat assessment before and after project implementation, photographic documentation before project implementation, during construction, and after project implementation, and sediment sampling and analyses prior to final designs for dam removal and permitting.

## **Personnel**

### **City of Manchester Parks Recreation & Cemetery Department**

Responsible for overall project management. Specific to data collection, responsible for compiling photographic documentation of project success under the guidance provided by the NHDES Photo Documentation Procedure for Measuring the Success of Restoration Projects and Best Management Practices. Photographic documentation will include pre-implementation, construction, and post-implementation.

#### **Charles DePrima - City of Manchester, Parks Recreation & Cemetery Dept.: Project Manager**

Responsible for managing this project. Will act as primary contact with NHDES and EPA. Will be responsible for “stop/go” instructions for all aspects of data collection. These instructions will be communicated mainly verbally in person, via phone, and/or via email. Written follow up shall be sent to the appropriate parties when necessary.

#### **Jonathan O-Rourke - City of Manchester, Parks Recreation & Cem. Dept.: Project Co-Manager**

Responsible for co-managing this project. Will coordinate project activities and will report to Charles DePrima, Project Manager.

## **USEPA**

#### **Warren Howard, USEPA Project Manager: USEPA New England**

Responsible for review and final approval of QAPP.

#### **Charles Porfert, USEPA Quality Assurance Representative**

Responsible for review and final approval of QAPP.

## **New Hampshire Department of Environmental Services (NHDES)**

Responsible for providing a site topographical map that that will be used as base mapping for this project.

#### **Eric Williams**

Section 319 of the Clean Water Act DES Watershed Assistance and Restoration Grants Program Manager.

#### **Steve Landry, Merrimack Watershed Supervisor: NHDES Watershed Assistance Section**

Overall NHDES Maxwell Pond Dam Removal/Black Brook Restoration Project Coordinator.

#### **Vincent Perelli Program QA Manager: NHDES Commissioner's Office**

Will make final review and approval on behalf of NHDES before sending to EPA for review.

#### **Jillian McCarthy, Program Quality Control Officer: NHDES Watershed Assistance Section**

Assists with QAPP preparation and review and other QA/QC activities.

#### **Lori Siegel, Ph.D., P.E., Ecological Risk Assessor: NHDES Watershed Management Bureau**

Responsible for reviewing and approving proposed Soils Sampling Plan (SSP).

Jennifer Drociak, Volunteer River Assessment Program Coordinator: Project DO/Phosphorus Sampling QA Officer

Will be responsible for heading up the DO/Phosphorus Sampling program and for organizing any necessary data and reporting required for this project.

Rachel Rainey, Laboratory QA Officer - NHDES Laboratory Services Unit (Concord, NH)

Oversees laboratory QA/QC activities and identifies necessary corrective actions. Will handle the phosphorus analysis of samples collected by VLAP and VRAP.

NHDES Dam Bureau

Responsible for supplying watershed information, such as hydrology data to DuBois & King, Inc. (Design Engineer) for Hydrologic and Hydraulic Evaluation to be performed.

NHDES Biomonitoring Program

Responsible for leading the effort to perform the Biological community (fish assemblages) assessments and habitat assessment above and below the Maxwell Pond/Black Brook Dam before and after project implementation. The NHDES Biomonitoring Program operates under an approved QAPP (December, 2003/Version 3). Fish community structure and abundance upstream and downstream of the existing dam on Maxwell Pond will be compared with identical surveys after dam removal to demonstrate that fish passage has been restored to Black Brook and that species diversity is consistent throughout Black Brook. Habitat assessments will also be compiled and compared at sites above and below the Maxwell Pond/Black Brook Dam before and after removal. Habitat assessments will be completed under the direct supervision of NHDES personnel.

David Neils, NHDES Biomonitoring Program Supervisor: Project Biomonitoring QA Officer

Is acting supervisor for the NHDES Biomonitoring Program. Will be responsible for heading up this program and for organizing any necessary data and reporting required for this project.

**DuBois & King, Inc.: Project Engineering and Planning**

Responsible for preparing and submitting a QAPP for this project for review by NHDES and EPA.

Responsible for performing sediment sampling and analyses prior to final designs for dam removal and permitting. This will be done through the Sediment Sampling Plan (SSP) attached in Appendix A. Protocols have been developed and included in the overall project QAPP according to NHDES sediment sampling and analyses guidance documents. Responsible for sample delivery directly to laboratory and for notifying sediment analysis laboratory as to when the sampling will occur and when to expect the samples.

Jeffrey Tucker, P.E., DuBois & King, Inc. Senior Vice-President: Project Manager and Project QA Officer

DuBois & King Project Manager and Project QA Officer. Responsible for updating QAPP. Responsible for reviewing field and laboratory data (sediment) against QC guidelines presented in this QAPP.

Matthew Murawski, DuBois & King, Inc. Project Field and Office Staff

Responsible for collecting and having sediment samples analyzed by laboratory. Responsible for assisting Jeffrey Tucker with reviewing sediment sampling field and laboratory data.

Daniel Moss, DuBois & King, Inc. Project Field and Office Staff

Responsible for collecting and having sediment samples analyzed by laboratory. Responsible for assisting Jeffrey Tucker with reviewing sediment sampling field and laboratory data.

Antonio Sanz, DuBois & King, Inc. Project Field and Office Staff

Responsible for collecting and having sediment samples analyzed by laboratory. Responsible for assisting Jeffrey Tucker with reviewing sediment sampling field and laboratory data.

Endyne Inc.

Responsible for laboratory analysis of the sediment samples taken.

Mark Fausel, Sediment Analysis Laboratory Manager and QA/QC Officer, Endyne, Inc. Laboratory Services

Endyne, Inc. Laboratory Manager and QA/QC Officer. Responsible for handling sediment analysis and QA/QC control at Endyne Laboratories for this project.

**Other**

Amoskeag Fishways

Will volunteer to assist NHDES Biomonitoring Program in performing the Biological community (fish assemblages) assessments and habitat assessment above and below the Maxwell Pond/Black Brook Dam before and after project implementation.

Manchester Conservation Commission

Members of Manchester Conservation Commission are currently performing voluntary lake assessments and sampling on all seven (7) existing ponds in the City of Manchester. After the removal of the Maxwell Pond Dam, the Manchester Conservation Commission will switch to voluntary river assessment of Black Brook.

The Manchester Fly Fishing Club

Will volunteer to assist NHDES Biomonitoring Program in performing the Biological community (fish assemblages) assessments and habitat assessment above and below the Maxwell Pond/Black Brook Dam before and after project implementation.

Trout Unlimited

Will volunteer to assist NHDES Biomonitoring Program in performing the Biological community (fish assemblages) assessments and habitat assessment above and below the Maxwell Pond/Black Brook Dam before and after project implementation.

Volunteer Lake Assessment Program (VLAP)

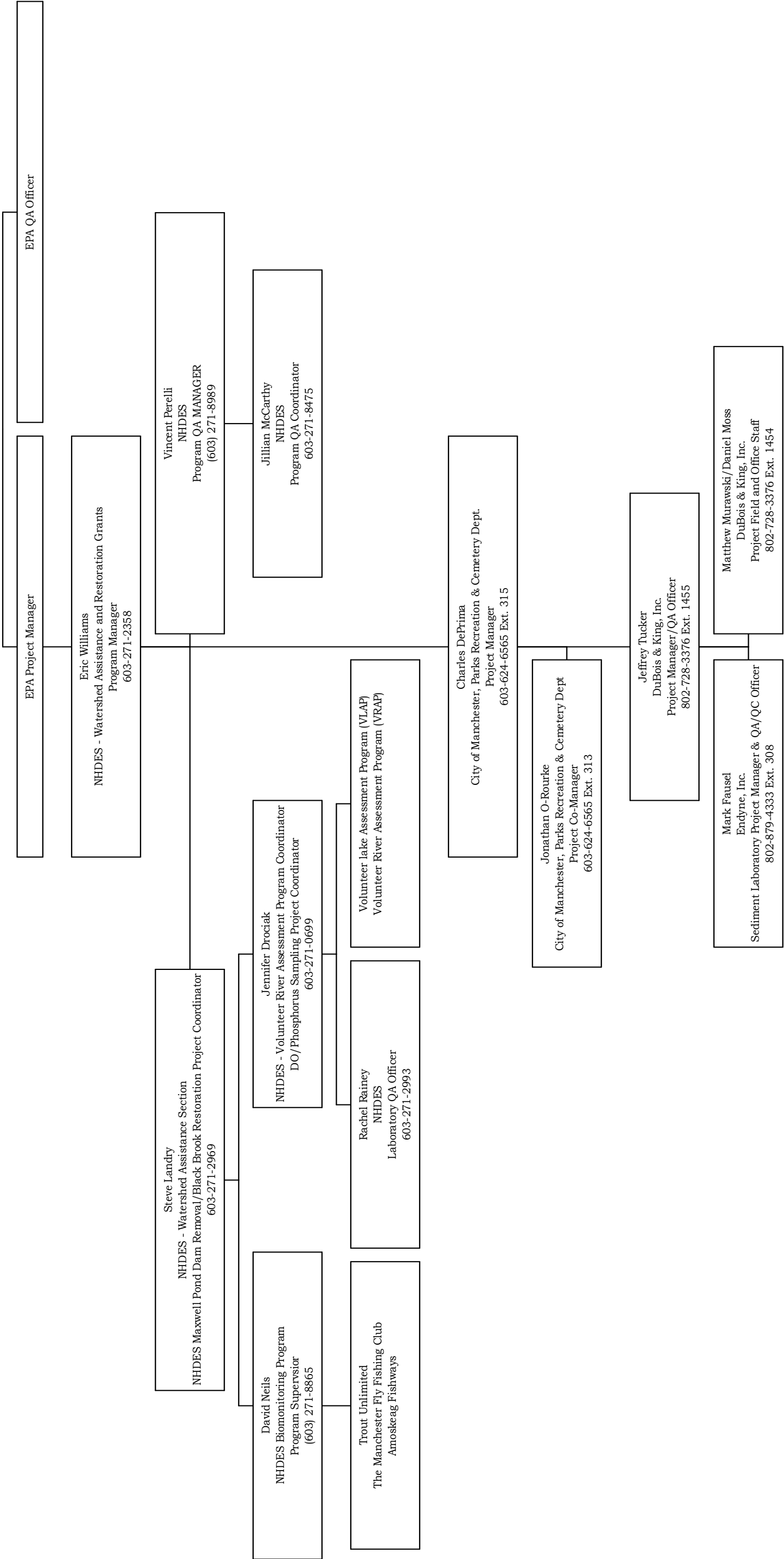
Will volunteer to field measure Dissolved Oxygen (DO) concentrations in and obtain water samples for phosphorus analysis from Maxwell Pond and Black Brook before and after project implementation. This program is administered by NHDES and has established Quality Assurance Project Plan (QAPP) that is approved by the EPA. May 10, 2005/Revision 2.0.

Volunteer River Assessment Program (VRAP)

Will volunteer to field measure Dissolved Oxygen (DO) concentrations in and obtain water samples for phosphorus analysis from Maxwell Pond and Black Brook before and after project implementation. This program is administered by NHDES and has established Quality Assurance Project Plan (QAPP) that is approved by the EPA (September 9, 2003/Revision Final).

Figure 1 shows an organizational chart for this project.

Figure 1: Project Organizational Chart

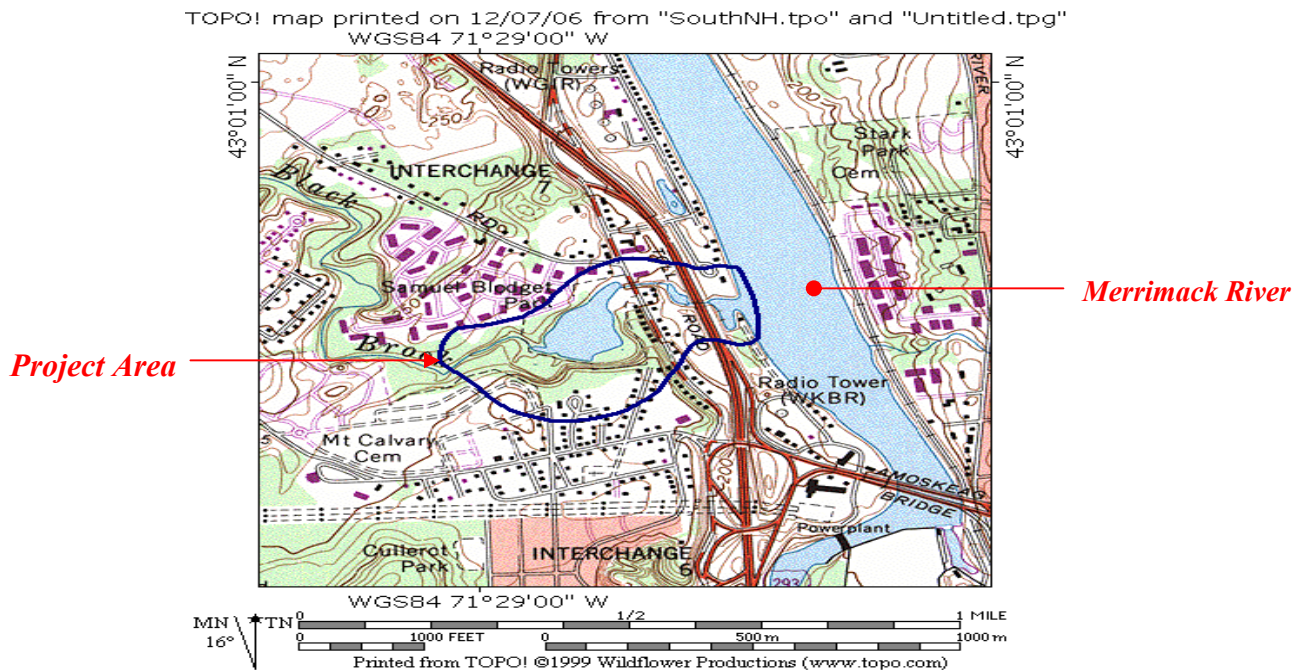


## **A5 – Problem Definition/Background**

The Maxwell Pond Dam Removal/Black Brook Restoration Project is an initiative of City of Manchester Parks Recreation & Cemetery Department with primary underwriting provided through a Watershed Assistance Grant from the New Hampshire Department of Environmental Services (NHDES) and Clean Water Act Section 319 funds from the United States Environmental Protection Agency (USEPA).

The construction of the Maxwell Pond Dam in 1900 altered the natural channel and hydrology within Black Brook. In addition to the hydrologic barrier that prevents migratory fish passage up Black Brook to and from the Merrimack River at this location, the dam and the pond it created have acted as a significant sediment sink since the early 1900s.

Maxwell Pond is 5.4-acre (approximate) pond located on Black Brook in Manchester, New Hampshire. The pond is impounded by a dam located immediately upstream of Front Street. The dam was constructed in 1900. The impoundment has been used for many purposes such as ice harvesting, and it was also a popular recreational area for many years. Development within the watershed has resulted in the steady decline of the quality of the pond, including increased sediment loads and warmer temperatures. In addition, the dam acts as a hydrologic barrier that prevents migratory fish passage up Black Brook to and from the Merrimack River. Since annual dredging was ceased a number of decades ago, the pond has been largely abandoned and unused. The dam and pond are currently owned by the City of Manchester and operated by the Department of Parks, Recreation and Cemeteries. See Figure 2, Maxwell Pond Locus Map below.

**Figure 2: Maxwell Pond Locus Map**

The objective of this project is to remove the dam and restore the immediate area of Black Brook in a manner that will be cost effective, will reduce the potential for future flooding at the dam, and significantly restore of Black Brook and associated aquatic habitat in the area. By doing so, this will allow fish to migrate up stream, which they have not been able to do in decades. Maxwell Pond is currently impaired by insufficient dissolved oxygen saturation in the water column (DES category 5-P and 5-M). This impairment has rendered Maxwell Pond incapable of supporting the Aquatic Life Designated Use for New Hampshire surface waters. Removal of the Maxwell Pond Dam will eliminate this dissolved oxygen impairment within the pond by improving circulation and lowering water temperatures. The channel downstream of the dam has become “starved” of sediments as a result of the dam installation that has lead to active erosion along both banks of the downstream channel. Removal of the Maxwell Pond Dam will remove this hydro-modification on Black Brook and restore approximately 6 miles of fish passage. The project will also reestablish Black Brook back into a free-flowing tributary to the Merrimack River with natural sediment transport capacity and a more self-maintaining channel that will reduce erosion. Removal of the dam will also help to reduce some safety concerns by eliminating the possibility of a dam breach, and the resulting flooding of many area homes and businesses as well as the Route 293 corridor. In addition, removal of the dam will significantly reduce future maintenance requirements by eliminating the costly repairs to what is now considered to be a non-functional dam.

#### **What Will Project Data Be Used For/What Decisions Will Be Made**

The most immediate measure and verification of project success will be the removal of the Maxwell Pond/Black Brook Dam. The removal of the dam will allow Black Brook to flow through its historical channel into the Merrimack River for the first time in over one hundred years.

Success of this project will be measured by the elimination of water quality impairments, support of designated uses in Black Brook, increased number of aquatic species migrating upstream and by the decrease in risk to area residents, businesses and travelers. Therefore, elimination of the existing water quality impairment shall be documented, the response of fish communities above and below the dam

before and after dam removal shall be monitored, and habitat assessment and photographic documentation of the project will all be used to monitor environmental success at this project site.

### **Type of Data Needed**

Quantitative verification measures of project success will include the following:

1. Dissolved Oxygen (DO) concentration measurements and phosphorus analysis before and after project implementation will be performed. Volunteers participating in both the Volunteer Lake Assessment Program (VLAP) and the Volunteer River Assessment Program (VRAP) will field measure for DO levels and will collect water samples for phosphorus analysis. Both programs are administered by NHDES and have established Quality Assurance Project Plans (QAPP) that are approved by the EPA. Once the dam has been removed, a minimum of ten samples will be collected according to the criteria established in the NHDES Comprehensive Assessment Listing Methodology (CALM) in order to demonstrate that Black Brook is meeting designated uses and the dissolved oxygen impairment has been eliminated. The NHDES Laboratory located in Concord, New Hampshire will perform phosphorus laboratory analysis.
2. Biological community (fish assemblages) assessments and habitat assessment above and below the Maxwell Pond/Black Brook Dam before and after project implementation will be completed. The NHDES Biomonitoring Program will lead this effort with assistance provided by volunteers from Trout Unlimited, the Manchester Fly Fishing Club, and Amoskeag Fishways. The NHDES Biomonitoring Program operates under an approved QAPP. Fish community structure and abundance upstream and downstream of the existing dam on Maxwell Pond will be compared with surveys after dam removal to demonstrate that fish passage has been restored to Black Brook and that species diversity enhanced throughout Black Brook. Habitat assessments will also be compiled and compared at sites above and below the Maxwell Pond/Black Brook Dam before and after removal. Habitat assessments will be completed under the direct supervision of NHDES personnel.
3. The City of Manchester, Parks Recreation & Cemetery Department will compile photographic documentation of project success under the guidance provided by the NHDES Photo Documentation Procedure for Measuring the Success of Restoration Projects and Best Management Practices. Photographic documentation will be performed pre-project implementation, during construction, and post-project implementation.
4. DuBois & King, Inc. will perform sediment sampling and analyses prior to final designs for dam removal and permitting. This will be done by following the Sediment Sampling Plan (SSP) attached in Appendix A and the additional details provided in this QAPP.

### **Who Will Use the Project Data**

The data generated by this study will be used by the city of City of Manchester, Parks Recreation & Cemetery Department and the NHDES Watershed Assistance Section to evaluate the effectiveness of the Maxwell Pond Dam Removal/Black Brook Restoration Project at eliminating water quality impairments and increasing the number of aquatic species migrating upstream. These data will be made available to the public upon request. NHDES will also use the data obtained from this project to inform other Dam Removal Projects.

### **Previous Data Surveys**

Attached Appendix B contains sampling and analysis results performed in Maxwell Pond by the Manchester Conservation Commission. These results were part of the Manchester Urban Pond Restoration Program Year 2 Report - May 2002 (2001 Sediment Data).

**A6 – Project/Task Description**

For the sake of completeness, the table below describes a number of products and project activities that are beyond the scope of this QAPP. Detailed descriptions of each task can be found in the Maxwell Pond Dam Removal/Black Brook Restoration Project 319 Grant Application.

**Table 2: Project Schedule Timeline**

Task Nos.	Activity	Dates (MM/DD/YYYY)		Product	Due Date
		Anticipated Date(s) of Initiation	Anticipated Date(s) of Completion		
1,3-5	QAPP Preparation	2/26/2007	7/30/2007	QAPP Document	NA
2	Sediment Sampling Plan (SSP)	2/26/2007	7/30/2007	SSP Document	NA
6-7	Sediment sampling & laboratory analysis	6/1/2007	8/30/2007	Pre- Implementation sediment analysis data	NA
8	DO analysis & water sampling & lab analysis (pre- implementation)	6/1/2007	8/31/2007	Pre- Implementation DO concentration levels	NA
9	Biological community (fish assemblages) and habitat assessments above and below the Maxwell Pond/Black Brook Dam (pre- implementation)	6/1/2007	8/31/2007	Pre- Implementation Biological community & habitat assessments	NA
10	Photographic documentation of the dam and project area (pre-implementation)	6/1/2007	8/31/2007	Pre-Implementation Photographic Documentation	NA
11-14	River Hydrologic/Hydraulic Analysis	4/2/2007	4/30/2007	Documentation of the reduction of flood water levels, stream power and shear in the restored area	NA
15-19	Preliminary Design	4/2/2007	7/2/2007	Preliminary Plans Opinion of Probable Cost	NA
20-23	Final Design, Permitting, Bid Procurement	7/23/2007	9/14/2007	NHDES Standard Dredge & Fill Application Wetlands Delineation Final Plans & Specs Secure Contractor	9/14/2007
24-26	Construction (dam removal & restoration)	10/1/2007	11/12/2007	Removal of Dam Restoration of Black Brook	11/30/07
24-28	Construction Site Visits and preparation of As-Built	10/1/07	11/12/2007	Construction Supervision As-Built Drawings	NA
	Photographic documentation of the dam and project area (during construction)	10/1/07	11/12/2007	Construction Activities Photographic Documentation	NA
29	DO analysis & water sampling & lab analysis (post-implementation)	11/12/2007	8/30/2008	Post-Implementation DO concentration levels	NA

**Table 2 (cont'd)**

Task Nos.	Activity	Dates (MM/DD/YYYY)		Product	Due Date
		Anticipated Date(s) of Initiation	Anticipated Date(s) of Completion		
30	Biological community (fish assemblages) and habitat assessments above and below the Maxwell Pond/Black Brook Dam (post-implementation)	11/12/2007	8/30/2008	Post-Implementation Biological community and habitat assessments data	NA
31	Photographic documentation of the dam and project area (post-implementation)	11/12/2007	8/30/2008	Post-Implementation Photographic Documentation	NA
32	Final Reporting	11/12/2007	8/30/2008	Quarterly and Final Reports to NHDES	NA

Based on EPA-NE Worksheet #10.

Notes: Highlighted rows are specifically QAPP applicable.

### **A7 – Quality Objectives and Criteria**

This Maxwell Pond Dam Removal/Black Brook Restoration Project QAPP in general covers QA/QC, standards, quality, etc. for sediment sampling and analysis only. Please refer to the Sediment Sampling Plan attached in Appendix A for further detail on the planned sediment sampling and analysis. Dissolved Oxygen (DO) field testing, water sampling/phosphorus analysis, and biological community and habitat assessments are covered under existing approved QAPPs by the NHDES Volunteer Lake Assessment Program (VLAP), the NHDES Volunteer River Assessment Program (VRAP), and the NHDES Biomonitoring Program. The NHDES Laboratory Services Unit performing the phosphorus analysis on the water samples collected by VLAP and VRAP has New Hampshire Environmental Laboratory Accreditation (NELAP) (see Appendix C for NELAP definition). The City of Manchester Parks Recreation & Cemetery Department, under the guidance of NHDES Watershed Program and following the NHDES Photo Documentation Procedure for Measuring the Success of Restoration Projects and Best Management Practices, shall perform photograph documentation of the project pre-implementation, during construction, and post-implementation.

According to the NHDES, the secondary data, collected in accordance with the referenced QAPPs, meets primary project QA/QC criteria and is sufficient to determine impairment status as required by the NH Consolidated Assessment Listing Methodology (CALM). Also according to the NHDES, the data used to impair Maxwell Pond came from the VLAP program. Both VLAP and VRAP have sufficiently high quality data to be used for final assessments. Accordingly, if either the VRAP or VLAP QAPPs are followed before and after dam removal, the data will be sufficient to delist the waterbody.

**Table 3: Measurement Performance Criteria for Soil Samples**

Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance
Precision-Overall	NA	Field Duplicates <sup>1</sup>
Precision-Lab	Generally <20%. See Lab SOPs. (See Appendices E, F, G, H)	Lab duplicates
Accuracy/Bias	Generally <30%. See Lab SOPs. (See Appendices E, F, G, H)	Lab spikes and blanks
Comparability	Deviation from SOPs should not influence more than 25% of data. (See Appendices E, F, G, H)	Data comparability check
Sensitivity	Reporting Limits > Action Levels (See Appendices E, F, G, H)	Laboratory fortified blanks
Data Completeness	75% soil samples collected and analyzed <sup>1</sup>	Data Completeness Check

Based on EPA-NE QAPP Workbook for 3/19/02 DES QAPP writing class.

Notes: 1. A field duplicate sample is not planned due to the low number of planned samples, and due to the homogeneity of the sediment supply. Specifically, most of the sediment that enters the impoundment is supplied by Black Brook to the west. In addition, coarser-grained sediments are likely trapped by impoundments upstream. It is envisioned that additional samples would be collected should individual samples exceed sediment guidelines

### **Precision**

Precision measurement data include laboratory and field duplicate data expressed as relative percent difference (RPD). Duplicate precision is typically analyzed by calculating the relative percent difference (RPD) using the equation:

$$RPD = \frac{|x_1 - x_2|}{\left(\frac{x_1 + x_2}{2}\right)} \times 100\%$$

where  $x_1$  is the original sample concentration  
 $x_2$  is the duplicate sample concentration

The sediment analysis laboratory (Endyne, Inc.) analyzes matrix duplicates every 20 samples or with each analyzed batch, whichever is more frequent. See Appendices E, F, G, and H for additional information.

No field duplicates are planned at this time, and therefore sampling precision will not be determined.

### **Accuracy/Bias**

The sediment analysis laboratory (Endyne, Inc.) analyzes laboratory-fortified blanks and matrix spikes every 20 samples or each analyzed batch, whichever is more frequent. See Appendices E, F, G, and H for additional information.

$$\% \text{Accuracy} / \text{Bias} = \frac{\text{SpikedSampleConc.} - \text{UnspikedSampleConc.}}{\text{SpikedConc. Added}} \times 100\%$$

**Table 4: Sediment Measurement Performance Criteria**

Parameter	Precision	Accuracy	Reporting Limit
Also See Appendix H.			
VOCs	Lower of +/- 20% or control limit	Tabulated Control limit	10 ug/kg-200 ug/kg (See Table 6 & Appendix H)
SVOCs	Lower of +/- 20% or control limit	Tabulated Control limit	0 ug/kg-2,000 ug/kg (See Table 6 & Appendix H)
PAHs	Lower of +/- 20% or control limit	Tabulated Control limit	80 ug/kg (See Table 6 & Appendix H)
Pesticides	Lower of +/- 20% or control limit	Tabulated Control limit	<10 ug/kg (See Table 6 & Appendix H)
PCB's	Lower of +/- 20% or control limit	Lower of +/- 30% or control limit	<50 ug/kg (See Table 6 & Appendix H)
TOC			0.50 mg/kg-3.00 mg/kg (See Table 6 & Appendix H)
Metals-Soils	+/- 20%	+/- 10%	0.50 mg/kg-3.00 mg/kg (See Table 6 & Appendix H)

Note: 1. Control limits are compound specific and are presented in Appendix H.

### **Representativeness**

Representativeness is a measure of how closely the measured results reflect the actual concentration or distribution of the chemical compounds in the sampled media. Representativeness is assessed in both qualitative and quantitative terms. This QAPP covers the qualitative aspects of representativeness in terms of design of the field-sampling plan, sampling techniques, sample handling protocols, and associated documentation.

Laboratory and trip blank measurements will be detailed on a sample- and parameter-specific basis in the validation reports. All qualifications as a result of laboratory and trip blank effects will be incorporated into the project sample/analyte specific data. See attached Appendices E, F, G, and H for information regarding representativeness for the sediment analysis laboratory (Endyne, Inc.'s).

The planned four (4) sediment samples for the project will be representative due to the homogeneity of the sediment supply. Specifically, most of the sediment that enters the impoundment is supplied by Black Brook to the west. In addition, coarser-grained sediments are likely trapped by impoundments upstream, which means that the finer particles reaching Maxwell Pond will be prone to slower settling in a more distributed, uniform pattern. During field sampling, discrete sediment horizons, if present, will be noted and used to assess the uniformity of the sediment deposits. The following locations are considered representative for the project. See Figure 3 and 4 (Section B1) for mapping representing these proposed locations:

MP-S1: Upstream of the confluence of Black Brook and Maxwell Pond (if possible)

MP-S2: Within Maxwell Pond situated in the historical Black Brook stream channel

MP-S3: Immediately upstream of the Maxwell Pond Dam in the impoundment

MP-S4: Downstream of the Maxwell Pond Dam above the backwater influence of the Merrimack River

### **Comparability:**

Comparability expresses the confidence with which one data set can be compared to another. Comparability of data will be established through use of the following:

- Each sample will be collected in accordance with the protocols and guidance provided by NHDES (Evaluation of Sediment Quality for Dam Removals, October 20, 2005 and Evaluation of Sediment Quality Guidance Document, NHDES-WD-04-9, April 2005) and EPA (EPA-823-B-01-002, 2001).
- Standard analytical methods and QC procedures established in this QAPP, Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual (EPA-823-B-01-002), and standard NHDES Laboratory protocols will be followed.
- Consistent reporting units for a specified procedure will be used.
- MDLs for all analytical parameters that were established in accordance with NHDES recommendations/requirements before the start of the analyses to meet the project requirements will be utilized.
- The Sediment Analysis Laboratory (Endyne, Inc.) will follow their NELAP approved Quality Systems Manual for all analysis procedures and quality control.

See attached Appendices E, F, G, and H for information regarding comparability for the sediment analysis laboratory (Endyne, Inc.'s).

The proposed sediment sampling and analysis methods conform to NHDES guidelines for dam removal projects. Thus the results of this study will be compared to other dam removal projects. Previous sampling results from Maxwell Pond followed comparable analytic techniques and are included in Appendix B.

### **Sensitivity**

Background information on the proposed Maxwell Pond sampling area exists (see Appendix B), and the data show that the methods and instruments are able to detect the parameter of concern and other target compounds at the level of interest. Detectable ranges of the methods and the equipment are adequate for the purposes of this study design. Detection and reporting limits are compound specific and are included in Table 5.

### **Quantitation Limits**

The analytical method, project action levels, analytical/achievable method detection limit, and the analytical/achievable laboratory reporting limits for this project are shown below in Table 5.

### **Completeness**

It is anticipated that core samples may not be able to be obtained upstream or downstream of the dam area due to bedrock issues in the Black Brook in those locations. Based on this and due to uniformity of the sediment source, sampling/testing will be considered complete if 75% of the analysis is completed. If a sample cannot be collected at a proposed location, the recovered samples of the remaining locations will be evaluated for stratification, and more discrete samples submitted for analysis rather than fewer composite samples.

**Table 5: Target Analytes and Reference Limits**

Parameter	CAS. No.	Method	Method Detection Limit (MDL) <sup>1</sup>	Reporting Limits (RL) <sup>1</sup>	Sediment Screening Thresholds	
					Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)
VOCs <sup>10</sup>		8260B <sup>9</sup>	0.51 ug/kg – 19.78 ug/kg	10 ug/kg - 200 ug/kg	See Note 2	See Note 2
SVOCs		8270C	5.34 ug/kg- 64.83 ug/kg	80 ug/kg - 2,000 ug/kg		
Benzo(g,h,i)perylene			25.01 ug/kg	80 ug/kg	290 ug/kg <sup>3</sup>	6,300 ug/kg <sup>3</sup>
Indeno(1,2,3-cd)pyrene			14.75 ug/kg	80 ug/kg	78 ug/kg <sup>3</sup>	836.66 ug/kg <sup>3</sup>
PAHs (All SVOCs)		8270c-SIM	7.31 ug/kg- 25.01 ug/kg	80 ug/kg		
Anthracene	120127		21.58 ug/kg	80.0 ug/kg	57.2 ug/kg <sup>4</sup>	845 ug/kg <sup>4</sup>
Benz(a)anthracene	56553		13.51 ug/kg	80.0 ug/kg	108 ug/kg <sup>4</sup>	1,050 ug/kg <sup>4</sup>
Benzo(a)pyrene	50328		19.82 ug/kg	80.0 ug/kg	150 ug/kg <sup>4</sup>	1,450 ug/kg <sup>4</sup>
Chrysene	218019		18.37 ug/kg	80.0 ug/kg	166 ug/kg <sup>4</sup>	1,290 ug/kg <sup>4</sup>
Dibenz(a,h)anthracene	53703		17.37 ug/kg	80.0 ug/kg	33.0 ug/kg <sup>4</sup>	330 ug/kg <sup>4</sup>
Fluoranthene	206440		19.82 ug/kg	80.0 ug/kg	423 ug/kg <sup>4</sup>	2,230 ug/kg <sup>4</sup>
Fluorene	86737		11.77 ug/kg	80.0 ug/kg	77.4 ug/kg <sup>4</sup>	536 ug/kg <sup>4</sup>
Naphthalene	91203		9.77 ug/kg	80.0 ug/kg	176 ug/kg <sup>4</sup>	561 ug/kg <sup>4</sup>
Phenanthrene	85018		9.50 ug/kg	80.0 ug/kg	204 ug/kg <sup>4</sup>	1,170 ug/kg <sup>4</sup>
Pyrene	129000		16.01 ug/kg	80.0 ug/kg	195 ug/kg <sup>4</sup>	1,520 ug/kg <sup>4</sup>
PAH, Total	1000				1,610 ug/kg <sup>4</sup>	22,800 ug/kg <sup>4</sup>
Pesticides (Are All SVOCs)		8081A	0.69 ug/kg – 2.34 ug/kg	<10 ug/kg		
Chlordane	57749		2.34 ug/kg	<20 ug/kg	3.24 ug/kg <sup>4</sup>	17.6 ug/kg <sup>4</sup>
Dieldrin	60571		1.21 ug/kg	<10 ug/kg	1.90 ug/kg <sup>4</sup>	61.8 ug/kg <sup>4</sup>
Sum DDD	72548		1.07 ug/kg	<10 ug/kg	4.88 ug/kg <sup>4</sup>	28.0 ug/kg <sup>4</sup>
Sum DDE	72559		1.38 ug/kg	<10 ug/kg	3.16 ug/kg <sup>4</sup>	31.3 ug/kg <sup>4</sup>
Sum DDT	50293		0.98 ug/kg	<10 ug/kg	4.16 ug/kg <sup>4</sup>	62.9 ug/kg <sup>4</sup>
Total DDTs					5.28 ug/kg <sup>4</sup>	572 ug/kg <sup>4</sup>
Endrin	72208		0.69 ug/kg	<10 ug/kg	2.22 ug/kg <sup>4</sup>	207 ug/kg <sup>4</sup>
Heptachlor epoxide	1024573		1.50 ug/kg	<10 ug/kg	2.47 ug/kg <sup>4</sup>	16.0 ug/kg <sup>4</sup>
Lindane (gamma-BHC)	58899		2.09 ug/kg	<10 ug/kg	2.37 ug/kg <sup>4</sup>	4.99 ug/kg <sup>4</sup>
PCB Aroclors		8082	See App. H	<50 ug/kg		
Total PCB	1336363		See App. H	See App. H	59.8 ug/kg <sup>4</sup>	676 ug/kg <sup>4</sup>
TOC		9060		100 ug/g <sup>6</sup>	NA	NA
Sieve with hydrometer		ASTM D422		#4, 10, 40, 200 and silt and clay		NA

Parameter	CAS. No. Method		Method Detection Limit (MDL) <sup>1</sup>	Reporting Limits (RL) <sup>1</sup>	Sediment Screening Thresholds	
					Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)
<b>Metals</b>		6010B/ 7471A	0.144 mg/kg - 1.09 mg/kg	0.50 mg/kg- 3.00 mg/kg		
Arsenic	22569728		0.676 mg/kg	2.00 mg/kg	9.79 mg/kg <sup>4</sup>	33 mg/kg <sup>4</sup>
Barium <sup>7</sup>	7440393		0.373 mg/kg	2.00 mg/kg		48 mg/kg <sup>5</sup>
Cadmium	7440439		0.150 mg/kg	0.50 mg/kg	0.99 mg/kg <sup>4</sup>	4.98 mg/kg <sup>4</sup>
Chromium	1308141		0.257 mg/kg	1.00 mg/kg	43.4 mg/kg <sup>4</sup>	111 mg/kg <sup>4</sup>
Copper	7440508		0.235 mg/kg	1.00 mg/kg	31.6 mg/kg <sup>4</sup>	149 mg/kg <sup>4</sup>
Lead	7439921		0.468 mg/kg	2.00 mg/kg	35.8 mg/kg <sup>4</sup>	128 mg/kg <sup>4</sup>
Nickel	7440020		0.334 mg/kg	1.50 mg/kg	22.7 mg/kg <sup>4</sup>	48.6 mg/kg <sup>4</sup>
Zinc	7440666		0.373 mg/kg	1.50 mg/kg	121 mg/kg <sup>4</sup>	459 mg/kg <sup>4</sup>
Mercury	7439976		0.300 mg/kg	0.60 mg/kg	0.18 mg/kg <sup>4</sup>	1.06 mg/kg <sup>4</sup>
Dissolved Oxygen <sup>8</sup>		Field Measure	0.2 mg/L	0.5 mg/L		
Biological Communities & Habitat Assessments <sup>8</sup>		Field Measure				

Based on EPA-NE Worksheet #9b and 9c.

1. Provided by Endyne, Inc. (See Appendix H). Reported as dry weight.
2. For contaminants with no available threshold, such as VOC, calculate a standard using the contaminant's surface water standard with appropriate partitioning coefficients. This will be done after receipt of lab results if need be
3. Reference 14.
4. Reference 7. Reported as dry weight.
5. Reference 13.
6. Endyne, Inc. (Adirondack Environmental Services) TOC SOP data.
7. Barium is a TCLP compound. It is comparable to silver for MDL and RL values.
8. Dissolved Oxygen (DO) sampling and testing and biological community and habitat assessments are covered under existing approved QAPS by the NHDES Volunteer Lake Assessment Program, the NHDES Volunteer River Assessment Program, and the NHDES Biomonitoring Program.
9. Endyne Inc's SOP for Volatile Organics analysis is method "EPA 8260B". Appendix A of this SOP only references the soil preparation component of the analysis method to be "EPA 5035". The actual analytical method is still EPA 8260B.
10. See sampling procedure described in Volatile Organic Compounds Method EPA 8260/8260B SOP's Appendix A attached in QAPP Appendix G.

### **Threshold/Actions Levels**

For each contaminant, an appropriately conservative Threshold Effect Concentration (TEC) and Probable Effect Concentration (PEC) were researched from available guidelines for each contaminant of concern (References 7, 13, 14, and 20). TEC values are screening thresholds below which adverse effects are unlikely. PEC values are screening thresholds above which adverse effects are likely. For freshwater environments, although consensus-based (CB) TEC and PEC values (Reference 7) are not the most conservative, they do have the most statistical justification (NHDES-WD-04-9). Values from References 13, 14, and 20 were utilized when a value could not be found in Reference 7. Only compounds with a known TEC and PEC are shown even though there may be numerous other compounds tested for by laboratory (SVOCS, PAHs, Pesticides, PCBs, etc). See attached Endyne 2007 Quality Control Data in Appendix H for full suite of compounds for each analyte category.

The list of parameters, method detection limits (MDLs) and project quantitation limit (reporting limits (RL)) were provided by the sediment analysis laboratory (Endyne, Inc.) (see Appendix H). The

laboratory will report the concentration down to the method detection limits (MDL), flagging values between the MDL and the RL and equal to or exceeding the TEC and PEC values.

### **A8 – Special Training/Certification**

DuBois & King, Inc. shall oversee the sediment sample collection. Sediment sample collection will be conducted and overseen by a qualified geologist, engineer, or individual with similar technical training and background. Each sample will be collected in accordance with the protocols and guidance provided by DES (Evaluation of Sediment Quality Guidance Document, NHDES-WD-04-9) and EPA (EPA-823-B-01-002, 2001). DuBois & King is responsible for assuring the sediment sampling field assistants are trained to perform fieldwork. DuBois & King will conduct the training, and/or supplement and fine-tune any prior training the field assistant has had. This training includes operation and appropriate use of field equipment, procedures for taking samples, procedures for taking comprehensive and readable field notes, and understanding the appropriate need for accuracy and quality control in data collection. Field assistants are required to be familiar with the QAPP and SSP.

The laboratory performing the sediment analysis (Endyne, Inc. Laboratory Services) is NELAP accredited. Details of the labs certifications and training requirements for laboratory personnel are found in the Quality Systems Manual (by Endyne, inc.), Certificate and Analyte List from NH ELAP, and Standard Operating Procedures (SOPs) (by Endyne, Inc.) attached in Appendix E, F, and G.

Any necessary special training or certifications needed for the Dissolved Oxygen (DO) field measuring, water sampling/phosphorus analysis, biological community and habitat assessments, and photographic documentation are covered under existing approved QAPPS and SOPs.

Any applicable training records will be maintained for the project by each respective entity involved.

### **A9 – Documents and Records**

The sections below describe the documents and records that will be prepared for each round of sampling by each project group. Section C2 describes the reports that will be prepared and Section B10 further discusses Data Management by each group.

#### **Sediment Sampling/Analysis**

All documents, records, and data will be stored electronically on DuBois & King's computer system, in project specific folders. Files are to be backed up on a regular basis. Project files are archived and kept a minimum of ten (10) years. Hard copies of field data, field documents, second hand data, or print outs of on-going work will be stored in a file located on the DuBois & King premises. Electronic and paper hard copies of all these files shall be given to the City of Manchester and NHDES as well for their records.

A copy of the approved QAPP and SSP will be electronically stored in NHDES's database and a hard copy will be retained in the project file. Major changes to the QAPP will be submitted to the City of Manchester, EPA, and NHDES for approval.

Field documents shall include sample custody seals (if applicable), chain-of-custody records, packing lists (if applicable), field notes, and field logs. All field documents will be maintained by the DuBois & King. Team members will retain the original copies. Field notes must be completed on-site at the time the data collection occurs. The minimum required information on field notes to be included is as follows:

- Project Name
- Company

- DuBois & King Project Manager (Jeffrey Tucker)
- Sampling Team members
- Date
- Detailed location of sample
- Time of Day
- Weather conditions
- Any necessary notes or supplemental forms used
- Equipment used – to include manufacturer, type, and serial number (if available)

A sample Sediment Sampling Field Notes form is attached in Appendix D.

Information for each sediment sample will be recorded in a field log and will include the following at a minimum:

- Date
- Time
- Initials of sampler
- Weather conditions
- Sample identification number
- Location (GPS coordinates (northing/easting) w/ sub-meter accuracy or field measured ties to permanent features)
- Water depth
- Probing depth
- Sediment type (based on probing)
- Sediment description
- Sample type (if more than one method is used to collect sample)
- Approximate length of sediment core
- Depth of penetration of the core recovered tube into the sediment

A sample Field Log Form is attached in Appendix D.

All lab analysis records will be organized, filed, maintained according to the Quality Systems Manual for Endyne, inc. attached in Appendix E and G.

### **Photographic Documentation of Project**

The City of Manchester Parks Recreation & Cemetery Department shall compile photographic documentation of pre-project implementation, during construction, and post-project implementation under the supervision of NHDES and will follow the guidance provided by the NHDES Photo Documentation Procedure for Measuring the Success of Restoration Projects and Best Management Practices.

Photographic documentation will clearly display the entire project area and indicate precisely where and of what the photograph was taken of with a descriptive caption. The date the photograph was taken shall also be recorded on each photograph. In addition, a site plan with photograph stations identified that indicates where and in what direction the photographs were taken will be prepared.

All documents, records, and data will be stored electronically on the City of Manchester Parks Recreation & Cemetery Department's computer system, in project specific folders. Files are to be backed up on a regular basis. Project files are archived and kept a minimum of ten (10) years. Hard copies of field data, field documents, and print outs of on-going work will stored in a file located on the City of Manchester Parks Recreation & Cemetery Department premises. Electronic and paper hard copies of all these files shall be given to DuBois & King, Inc. and NHDES as well for their records.

A final report containing the organized photographic documentation of pre-project implementation, construction, and post-project implementation shall be produced by the City of Manchester Parks Recreation & Cemetery Department. An electronic and hard copy of this final report shall be sent to NHDES for their review and records.

#### **Dissolved Oxygen Concentration Measurements & Water Sampling/Phosphorus Analysis**

Water quality monitoring will be done under the direction of the NHDES in accordance with existing approved QAPPs for the Volunteer Lake Assessment Program (VLAP) and the Volunteer River Assessment Program (VRAP). A brief summary of the documents and records associated with this work is provided below.

The water samples collected will be delivered to Rachel Rainey of the NHDES laboratory located in Concord, NH. All data generated by VLAP, VRAP, and the NHDES Laboratory will be processed by NHDES in-house. Once this data is processed, it will be entered into the NHDES Environmental Monitoring Database (EMD). This NHDES Environmental Monitoring Database will be the official location this data will be stored and checked for Quality Control. This data will then be made available to the public via the Internet.

Final reports will be generated by NHDES Watershed Bureau via the NHDES Environmental Database and distributed to the City of Manchester Parks Recreation & Cemetery Department, the Manchester Conservation Commission, and DuBois & King.

#### **Biological Community (Fish Assemblages) Assessments And Habitat Assessment**

Biological community (fish assemblages) assessments and habitat assessment will be done under the direction of the NHDES Biomonitoring Program in accordance with existing an approved Generic Quality Assurance Project Plan For New Hampshire Biomonitoring Program. Volunteers from Trout Unlimited, the Manchester Fly Fishing Club, and Amoskeag Fishways shall assist with this work. A brief summary of the documents and records associated with this work is provided below.

All data generated by Trout Unlimited, the Manchester Fly Fishing Club, and Amoskeag Fishways will be processed by the NHDES Biomonitoring Program in-house. Once this data is processed, it will be entered into the NHDES EMD. The NHDES EMD will be the official location this data will be stored and checked for Quality Control. This data will then be made available to the public via the Internet.

No specific year-end reports are typically generated by the NHDES Biomonitoring Program. Steve Landry, Overall NHDES Maxwell Pond Dam Removal/Black Brook Restoration Project Coordinator, will therefore request David Neils, NHDES Biomonitoring Program Director, have a special report produced dealing with the Maxwell Pond Dam Removal/Black Brook Restoration Project. The recipients of this report shall be the NHDES Watershed Bureau, the City of Manchester Parks Recreation & Cemetery Department, and DuBois & King.

## **B1 – Sampling Process Design**

#### **Sediment Sampling/Analysis**

Refer to attached Sediment Sampling Plan (SSP) in Appendix A for details on the sampling process design. This SSP was based on the protocols and guidance provided by NHDES (Evaluation of Sediment Quality for Dam Removals, October 20, 2005 and Evaluation of Sediment Quality Guidance Document, NHDES-WD-04-9, April 2005) and EPA (EPA-823-B-01-002, 2001). Expected concentrations are based on the Manchester Urban Pond Restoration Program Year 2 Report - May 2002 (2001 Sediment Data) attached in Appendix B. Concentrations are expected to be less than the threshold values listed in Table 5

found in Section A7 with the possible exception of a few metals (barium, lead, mercury, and zinc).

**Table 6: Sediment Field Sample Summary**

Parameter	No. of sampling locations	Samples per event per sampling location	Number of sampling events	Number of field duplicates <sup>1</sup>	Number of bottle blanks	Total number to lab
Sediment	4	1	1	0	NA	4

Based on EPA-NE Worksheet #9c.

<sup>1</sup>No field duplicates are planned at this time – See Section A7

The following are the sampling locations for the project. See Figures 3 and 4 below for mapping representing these proposed locations:

MP-S1: Upstream of the confluence of Black Brook and Maxwell Pond (if possible)

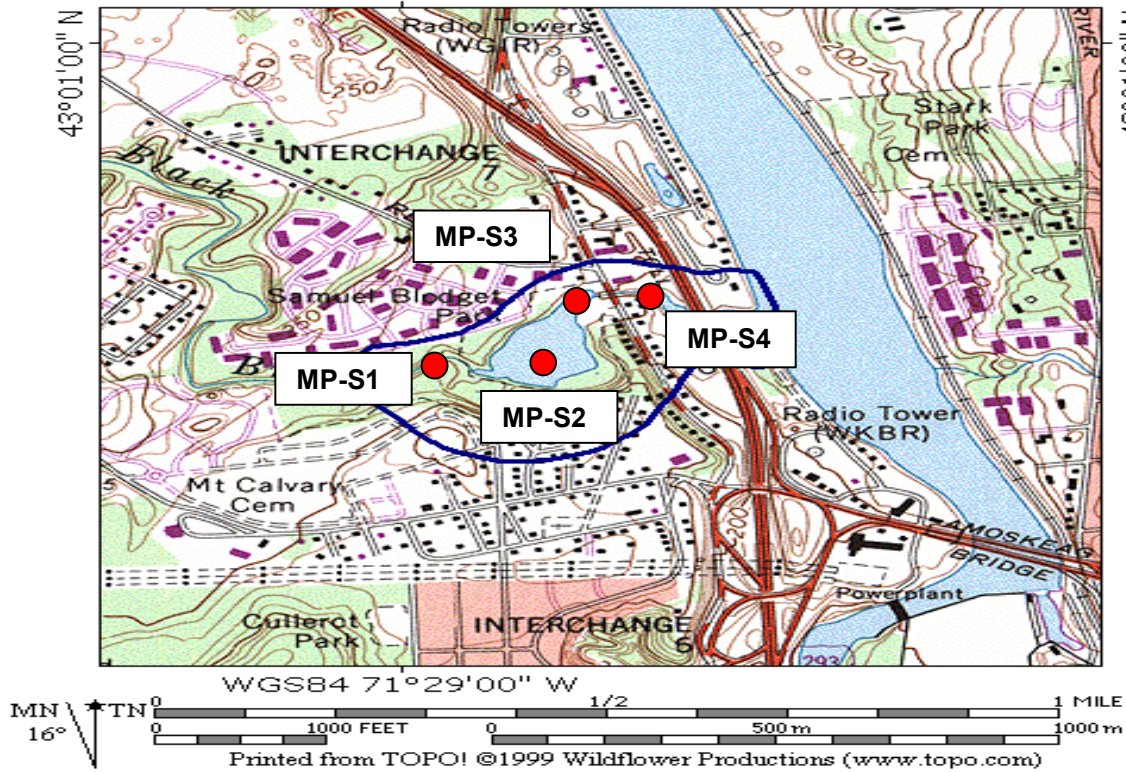
MP-S2: Within Maxwell Pond situated in the historical Black Brook stream channel

MP-S3: Immediately upstream of the Maxwell Pond Dam in the impoundment

MP-S4: Downstream of the Maxwell Pond Dam above the backwater influence of the Merrimack River

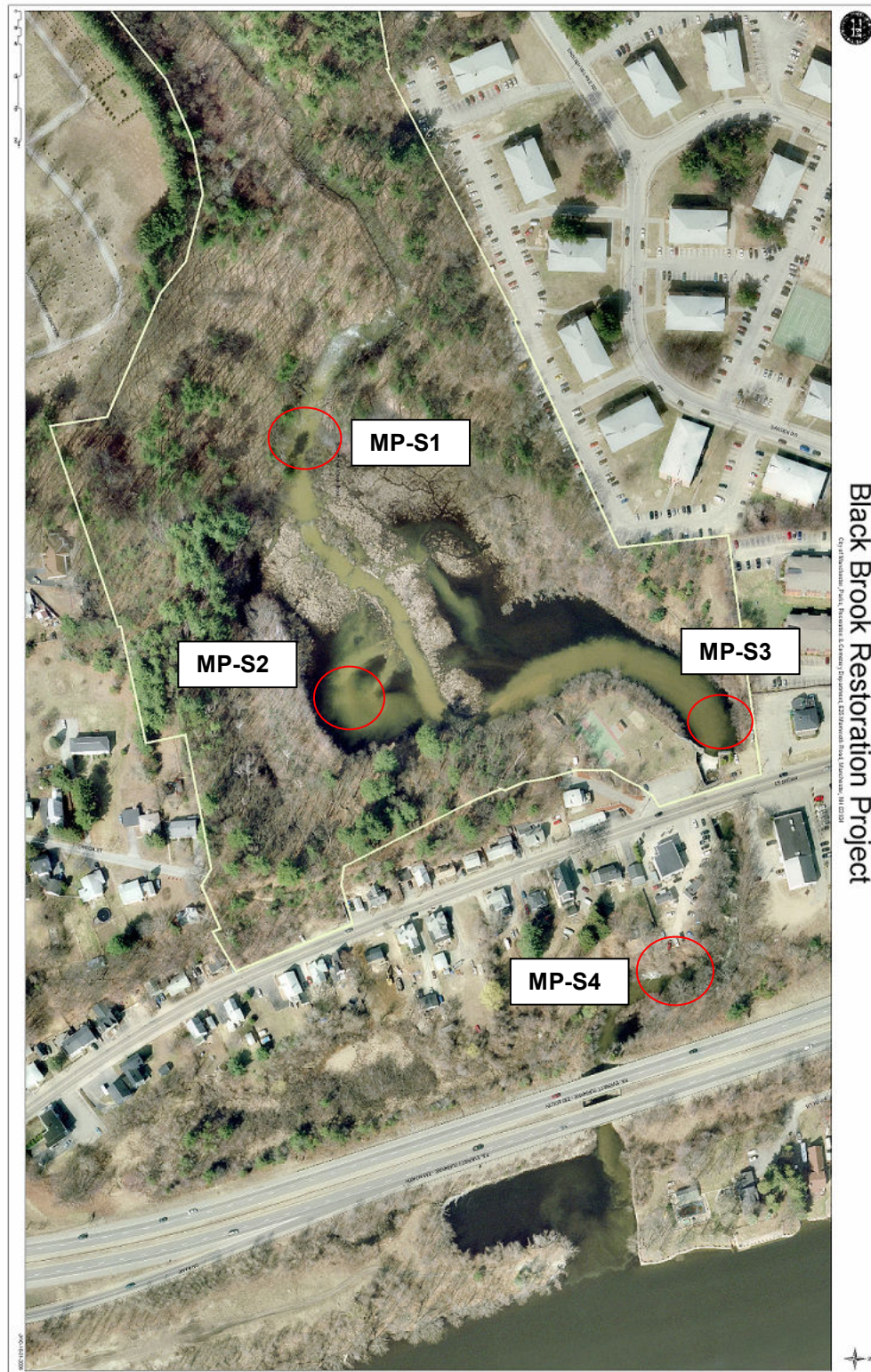
**Figure 3: Maxwell Pond Locus Map With Approximate Sediment Sampling Locations**

TOPO! map printed on 12/07/06 from "SouthNH.tpo" and "Untitled.tpg"  
WGS84 71°29'00" W



● = Proposed Sediment Sampling Location

**Figure 4: Maxwell Pond Impoundment & Black Brook Aerial Map With Proposed**



 = Proposed Sediment Sampling Area

Black Brook Restoration Project

**Photographic Documentation of Project**

The City of Manchester Parks Recreation & Cemetery Department will prepare a Photo Documentation Plan that identifies 5-10 photograph stations and prescribes the number and direction of photographs to be taken from each station. The City will follow the guidance provided by the NHDES Photo Documentation Procedure for Measuring the Success of Restoration Projects and Best Management Practices.

**Dissolved Oxygen Concentration Measurements & Water Sampling/Phosphorus Analysis**

The sampling stations for dissolved oxygen/phosphorous monitoring will be identified and monitored under the umbrella of the NH Department of Environmental Services' Volunteer Lake Assessment Program (VLAP) and Volunteer River Assessment Program (VRAP). These stations will be monitored by affiliates of the Manchester Conservation Commission as well as volunteers.

VLAP samples will be collected from the deep spot of Maxwell Pond (immediately upstream of the dam) and analyzed for dissolved oxygen and phosphorous. VLAP samples will also be collected in Black Brook just upstream of the pond and just below the dam (above the backwater effect of the Merrimack River).

Once the dam is removed, VRAP samples will be collected from both the upstream and downstream stations.

**Biological Community (Fish Assemblages) Assessments And Habitat Assessment**

Biological community (fish assemblages) assessments and habitat assessment will be done under the direction of the NHDES Biomonitoring Program in accordance with existing an approved Generic Quality Assurance Project Plan For New Hampshire Biomonitoring Program. Volunteers from Trout Unlimited, the Manchester Fly Fishing Club, and Amoskeag Fishways shall assist with this work.

Biomonitoring sites will be established on the reach below the dam and on Black Brook immediately upstream of the pond. The downstream reach will be situated above the backwater effect from the Merrimack River and run upstream to the base of the dam.

**B2 – Sampling Methods****Sediment Sampling/Analysis**

Refer to attached Sediment Sampling Plan (SSP) in Appendix A for details on sampling methods. In addition, the protocols and guidance provided by NHDES (Evaluation of Sediment Quality for Dam Removals, October 20, 2005 and Evaluation of Sediment Quality Guidance Document, NHDES-WD-04-9, April 2005) and EPA (EPA-823-B-01-002, 2001) shall also be followed.

All sediment laboratory analysis methods will be handled according to the Quality Systems Manual and SOPs for Endyne, Inc. attached in Appendices E and G.

**Photographic Documentation of Project**

Photographs will be taken by the City of Manchester Parks Recreation & Cemetery Department with a digital camera at the locations identified in the Photographic Documentation Plan described in Section B1. The City will follow the guidance provided by the NHDES Photo Documentation Procedure for Measuring the Success of Restoration Projects and Best Management Practices.

**Dissolved Oxygen Concentration Measurements & Water Sampling/Phosphorus Analysis**

Water quality sampling will be done under the direction of the NHDES in accordance with existing approved QAPPS for the Volunteer Lake Assessment Program (VLAP) and the Volunteer River Assessment Program (VRAP). Sampling methods can be found in those QAPPs.

**Biological Community (Fish Assemblages) Assessments And Habitat Assessment**

Biological and habitat monitoring will be done by the NHDES Biomonitoring Program under an existing approved QAPP. Volunteers from Trout Unlimited, the Manchester Fly Fishing Club, and Amoskeag Fishways shall assist with this work. Sampling methods can be found in that QAPP.

**B3 – Sample Handling and Custody**

**Sediment Sampling/Analysis**

All equipment used to collect and handle samples must be cleaned and all parts examined to ensure proper functioning before going into the field. Backup equipment and sampling gear should be available. Appropriately cleaned sample bottles will be provided by the laboratory. These containers will be labeled appropriately (i.e., with a waterproof adhesive label to which the appropriate data can be added, using an indelible ink pen capable of writing on wet surfaces). A sample label is presented below as Figure 5.

**Figure 5: Maxwell Pond Sediment Sampling Container Example Label**

Project Name
Sample Name
Sample Location
Sampler Name
Date
Time
Preservative
Test

The containers will have lids that can be fastened securely. Storage, transport, and sample containers, including extra containers will be available in the event of loss or breakage.

A field log and soil boring logs (See Appendix D) will be utilized for sampling recording. A single person will be responsible for these logs that will track the samples from the time they are collected until they are analyzed and disposed of or archived. To ensure sediment samples are not contaminated from one sample location to the next, sampling equipment will be cleaned following EPA guidelines.

Samples will be placed in coolers with ice. DuBois & King shall deliver the coolers containing the sediment samples directly to the sediment-testing laboratory (Endyne, Inc. Laboratory Services) in Randolph, VT together with a completed Chain-of-Custody form and instructions for the laboratory for compositing of the subsamples for each area. Subsamples from each area will be labeled separately, e.g., MP-S1a, MP-S1b, MP-S1c. Endyne, Inc. will then transport the samples to their sediment analysis facility in Williston, VT according to the protocols in the Quality Systems Manual for Endyne, Inc. attached in Appendix E.

All sample handling and custody protocols will be followed by the sediment analysis laboratory according to the Quality Systems Manual for Endyne, Inc. attached in Appendix E.

Refer to attached Sediment Sampling Plan (SSP) in Appendix A, NHDES Evaluation of Sediment Quality for Dam Removals, October 20, 2005, Evaluation of Sediment Quality Guidance Document, NHDES-WD-04-9, April 2005, and EPA (EPA-823-B-01-002, 2001) for further details on sediment handling and custody care.

**Table 7: Sample Requirements**

Analytical parameter	Collection method	Sampling SOP	Sample volume	Container type	Preservation requirements	Max. holding time (preparation and analysis)
VOC <sup>1</sup>	Grab	Appendix A, E, G	Full 40 mL	Glass Vial	4°C, Methanol	14 days
SVOC	Grab	Appendix A, E, G	250 mL	Amber Glass	4°C	14 days/40 days
PAHs	Grab	Appendix A, E, G	250 mL	Amber Glass	4°C	14 days/40 days
Pesticides	Grab	Appendix A, E, G	250 mL	Amber Glass	4°C	14 days/40 days
PCBs	Grab	Appendix A, E, G	250 mL	Amber Glass	4°C	14 days/40 days
TOC	Grab	Appendix A, E, G	25 mL	Plastic or Glass	Cool, 4°C	14 days
Metals-Soils	Grab	Appendix A, E, G	50 grams	Plastic or Glass	Cool, 4°C	6 mos.

Based on EPA-NE Worksheet #12b.

Note: 1. See sampling procedure described in Volatile Organic Compounds Method EPA 8260/8260B SOP's Appendix A attached in QAPP Appendix G.

### **Photographic Documentation of Project**

The City of Manchester Parks Recreation & Cemetery Department will download photographs within 24 hours of the field visit they were taken to confirm that pictures were successful and taken from all required stations.

### **Dissolved Oxygen Concentration Measurements & Water Sampling/Phosphorus Analysis**

Water quality sampling will be done under the direction of the NHDES in accordance with existing approved QAPPS for the Volunteer Lake Assessment Program (VLAP) and the Volunteer River Assessment Program (VRAP). Sample handling and custody protocols can be found in those QAPPS.

### **Biological Community (Fish Assemblages) Assessments And Habitat Assessment**

Biological and habitat monitoring will be done by the NHDES Biomonitoring Program under an existing approved QAPP. Volunteers from Trout Unlimited, the Manchester Fly Fishing Club, and Amoskeag Fishways shall assist with this work. Sample handling and custody protocols can be found in that QAPP.

## **B4 – Analytical Methods**

### **Sediment Analysis**

Refer to attached Sediment Sampling Plan (SSP) in Appendix A for details on analytical methods to be used. This SSP was based on the protocols and guidance provided by NHDES (Evaluation of Sediment Quality for Dam Removals, October 20, 2005 and Evaluation of Sediment Quality Guidance Document, NHDES-WD-04-9, April 2005) and EPA (EPA-823-B-01-002, 2001).

The laboratory performing the sediment analysis (Endyne, Inc. Laboratory Services) is NELAP certified (see Appendices E and F) and therefore will be assumed to use all the proper analytical methods accordingly. Information for analytical methods and corrective actions in particular, for the sediment analysis laboratory is outlined in the Quality Systems Manual and SOPs for Endyne, Inc. attached in Appendices E and G.

**Photographic Documentation of Project**

Analytical methods are not applicable to this activity.

**Dissolved Oxygen Concentration Measurements & Water Sampling/Phosphorus Analysis**

Water quality sampling will be done under the direction of the NHDES in accordance with existing approved QAPPs for the Volunteer Lake Assessment Program (VLAP) and the Volunteer River Assessment Program (VRAP). Details on analytical methods to be used can be found in the existing, approved QAPPs for those programs.

Jen Drociak, Volunteer River Assessment Program (VRAP) Coordinator and affiliate of the Manchester Conservation Commission will be responsible in implementing corrective actions should there be a problem with the DO/phosphorous sampling/analysis.

**Biological Community (Fish Assemblages) Assessments And Habitat Assessment**

Biological and habitat monitoring will be done by the NHDES Biomonitoring Program under an existing approved QAPP. Volunteers from Trout Unlimited, the Manchester Fly Fishing Club, and Amoskeag Fishways shall assist with this work. Details on analytical methods to be used can be found in that QAPP.

David Neils, the Biomonitoring Program Coordinator at NHDES, is responsible for Biomonitoring Program data and analyses. If problems occur, David is responsible for assessing the situation, and determining a course of corrective action.

All data collected via biomonitoring protocols will be collected according to the Generic Biomonitoring QAPP. Data analysis and interpretation will follow established biological indices, where applicable, but may require alternative techniques depending on site conditions, quantity of data, and the specific type of aquatic communities encountered. In all cases, a complete methodological explanation of the data analysis and interpretation techniques will be completed, including references to statistical techniques. Corrective actions will include adaptation of established analysis techniques and decided by the NHDES biomonitoring program manager.

## **B5 – Quality Control**

**Sediment Sampling/Analysis****QC Procedures for Sample Collection**

A duplicate or split sample is not planned due to the low number of planned samples, and due to the homogeneity of the sediment supply.

**Field QA/QC Assessment**

QA/QC for field procedures will be addressed through implementation of a thorough inspection and audit process. This process will include routine observation and critique of the sample collection process by the field sampling coordinator. These inspections will include reviewing core collection techniques, preparation and transcription of field notes, accuracy of the GPS used to record core sample locations (if available and utilized), and ability of the selected equipment to obtain adequate samples. Additionally, the field processing station and core sample processing procedures will be reviewed to assure that the station and protocols are appropriate. Activities reviewed will include sample login, field data entry, core segmenting and sample homogenization procedures, container labeling, and sample packaging for shipment. The Field QA Manager will be informed of any deficiencies in the data, including field QA/QC sample data, and will investigate potential sources of these deficiencies within the field processes.

If the unacceptable conditions or data are realized, the DuBois & King QA/QC officer and/or DuBois & King Project Manager (Jeffrey Tucker) will develop and initiate appropriate changes or modifications that will be documented in the appropriate field log and summarized in the final report. Corrective actions may include the following options:

- Re-analyze samples if holding time and sample volume permit.
- Re-sampling and re-analyzing, if applicable.
- Evaluating and amending sampling and/or analytical procedures.
- Accepting data, while documenting a level of uncertainty

### **Laboratory and Data Management QA/QC Assessment**

The transfer of custody will be limited between DuBois & King personnel, laboratory courier (if applicable), and fixed base laboratory personnel. The primary objective of custody requirements for this project is simply to track that samples are handled by authorized personnel and document that handling occurred within the parameters of the SSP. Data verification of reports from the fixed base laboratory (Endyne, Inc., Laboratory Services) will be reviewed in general accordance with that lab's typical protocols. Please see Quality Systems Manual for Endyne, Inc. attached in Appendix E for information regarding the laboratory's data management QA/QC program.

### **Data Verification and Validation**

Verification and validation of the data will be performed to determine the usability of the data and to ensure results are generated in accordance with the procedures defined in the SSP. The DuBois & King Project Manager (Jeffrey Tucker) will be responsible to conduct a full-package review of the field process and data produced for the site and reports from the fixed base laboratory (Endyne, Inc. Laboratory Services). The fixed base laboratory (Endyne, Inc. Laboratory Services) Quality Assurance (QA) officers will conduct validation and reporting consistent with the parameters of Endyne Inc.'s Quality System Manual and SOPs attached in Appendices E and G. To facilitate data verification and validation, analytical results for all samples will be provided in a full data package in a scanned electronic media (Adobe® Acrobat® .pdf) and presented to the NHDES Watershed Bureau as part of the sediment analysis reporting. The NHDES will review the package and compare the methodology and results to the requirements identified in this QAPP. If either verification or validation by the NHDES Watershed Bureau identifies deficiencies in data quality, the source of the deficiencies will be investigated and corrective action will be taken.

### **QA/QC Samples**

A duplicate or split sample is not planned due to the low number of planned samples, and due to the homogeneity of the sediment supply. DuBois & King shall follow the EPA document Methods for Collection, Storage and Manipulation of Sediments (EPA-823-B-01-002). The following items that are covered in this QAPP and/or SSP attached in Appendix A will be followed:

- QA procedures will be followed to assure that SOPs are followed and that contamination is neither introduced to nor lost from the manipulated sample. Ex: Samples to be analyzed for trace metals will not come in contact with metal surfaces (except stainless steel).
- Sampling methodologies that will allow the collection of representative samples based upon data needs shall be used.
- EPA/NHDES accepted sampling devices that minimize the disturbance or alteration to the sediment's chemical composition shall be used.
- Decontamination procedures that reduce cross-contamination potential between sampling points shall be employed.

- Proper sample containers and preservation techniques required by the sediment testing laboratory will be utilized to maximize the integrity of samples

See Quality Systems Manual and SOPs for Endyne, Inc. attached in Appendices E and G for the laboratory's Quality Control Program description.

#### **Photographic Documentation of Project**

The City of Manchester Parks Recreation & Cemetery Department shall compile photographic documentation of pre-project implementation, during construction, and post-project implementation under the supervision of NHDES and will follow the guidance provided by the NHDES Photo Documentation Procedure for Measuring the Success of Restoration Projects and Best Management Practices.

#### **Dissolved Oxygen Concentration Measurements & Water Sampling/Phosphorus Analysis**

Water quality sampling will be done under the direction of the NHDES in accordance with existing approved QAPPS for the Volunteer Lake Assessment Program (VLAP) and the Volunteer River Assessment Program (VRAP). Quality Control protocols can be found in those QAPPs.

#### **Biological Community (Fish Assemblages) Assessments And Habitat Assessment**

Biological and habitat monitoring will be done by the NHDES Biomonitoring Program under an existing approved QAPP. Volunteers from Trout Unlimited, the Manchester Fly Fishing Club, and Amoskeag Fishways shall assist with this work. Quality Control protocols can be found in that QAPP.

**Table 8: Fixed Laboratory Sediment Analytical QC Sample Table**

Analyte	Laboratory Duplicate	Lab Fortified Matrix Spike	Frequency of		
			Lab Fortified Blank (QC Standard)	Lab Reagent Blank	Independent Calibration Verification (QC Standard)
VOC 8260B	Every 20 samples or w/ ea. data set	Every 20 samples or w/ ea. data set	Every 20 samples or w/ ea. data set	Every 20 samples or w/ ea. data set	Every 12 hours
SVOC 8270C	Every 20 samples or w/ ea. data set if vol./sample mass permits	Every 20 samples or w/ ea. data set if vol./sample mass permits	Every 20 samples or w/ ea. data set	Every 20 samples or w/ ea. data set	Every 12 hours
PAHs 8270C	Every 20 samples or w/ ea. data set if vol./sample mass permits	Every 20 samples or w/ ea. data set if vol./sample mass permits	Every 20 samples or w/ ea. data set	Every 20 samples or w/ ea. data set	Every 12 hours
Pesticides 8081A	Every 20 samples or w/ ea. data set if vol./sample mass permits	Every 20 samples or w/ ea. data set if vol./sample mass permits	Every 20 samples or w/ ea. data set	Every 20 samples or w/ ea. data set	Every 12 hours
PCBs 8082	Every 20 samples or w/ ea. data set if vol./sample mass permits	Every 20 samples or w/ ea. data set if vol./sample mass permits	Every 20 samples or w/ ea. data set	Every 20 samples or w/ ea. data set	Every 12 hours

**Table 9 (cont)**

Analyte	Frequency of				
	Laboratory Duplicate	Lab Fortified Matrix Spike	Lab Fortified Blank (QC Standard)	Lab Reagent Blank	Independent Calibration Verification (QC Standard)
Metals-Soils	Every Batch or every 20 samples	Every 20 samples or when results questionable	Every 20 samples or when results questionable	Every 20 samples or when results questionable	Every 10 samples

Loosely based on EPA-NE Worksheet #24b.

Note: Numeric QC Content are test and compound specific and are included in Appendices E and G.

### **B6/B7 – Instrument/Equipment Testing, Inspection, Maintenance, Calibration and Frequency**

#### **Sediment Sampling/Analysis**

Field sampling equipment including, but not limited to, a hand held hollow-stem auger and ¾" x 24" plastic retaining cylinder core sleeves will be inspected and tested prior to field deployment by DuBois & King, Inc. The plastic retaining cylinder core sleeves shall be inspected for signs of contamination, cracking, and other signs of defects. Replacement sleeves will be on hand. The auger kit will be inspected to ensure that all the parts to the kit are accounted for. The drill will be tested to ensure it is in good working condition. Any malfunctioning, broken, or missing equipment will be repaired or replaced. Additional auger kit parts will be available from the manufacturer, rental agency, or other entity the equipment is supplied from.

The sediment testing laboratory (Endyne, Inc.) follows rigorous testing, inspection, maintenance, and calibration protocols. Details are provided in the Quality Systems Manual and SOPs for Endyne, Inc. attached in Appendices E and G.

#### **Photographic Documentation of Project**

Digital camera will be tested and battery strength checked by the City of Manchester Parks Recreation and Cemetery Department prior to use in the field. The City shall have back-up equipment and parts on hand at the Parks Recreation and Cemetery Department office.

#### **Dissolved Oxygen Concentration Measurements & Water Sampling/Phosphorus Analysis**

See Appendix I: Dissolved Oxygen Concentration Measurements & Water Sampling/Phosphorus Analysis Standard Operating Procedures (SOP) for Instrument/Equipment Testing, Inspection, Maintenance, Calibration and Frequency information regarding Dissolved Oxygen Concentration Measurements & Water Sampling/Phosphorus Analysis.

#### **Biological Community (Fish Assemblages) Assessments And Habitat Assessment**

Biological and habitat monitoring will be done by the NHDES Biomonitoring Program under an existing approved QAPP. David Neils is responsible for instrument/equipment inspection, maintenance & calibration. Details on the procedures and frequency or inspection and maintenance activities can be found in the Generic Biomonitoring QAPP.

## **B8 – Inspection/Acceptance Requirements for Supplies and Consumables**

### **Sediment Sampling/Analysis**

Supplies and consumables used for field sampling include sample bottles, ¾" x 24" plastic retaining cylinder core sleeves, etc. All bottles will be inspected by DuBois & King, Inc. field staff (Daniel Moss and/or Matthew Murawski) to ensure seals (if applicable) are intact and identify any signs of possible contamination. Core sleeves and keepers will be inspected similarly by DuBois & King, Inc. field staff (Daniel Moss and/or Matthew Murawski).

See Quality Systems Manual and SOPs for Endyne, Inc. attached in Appendices E and G for the laboratory's Inspection/Acceptance Requirements for Supplies and Consumables Program description.

### **Dissolved Oxygen Concentration Measurements & Water Sampling/Phosphorus Analysis**

Jen Drociak will be responsible for use and maintenance of water quality equipment, procuring any necessary standards and/or solutions, and supplies such as bottles. Jen Drociak and/or the VLAP Coordinator and staff (interns) will be responsible for logging total phosphorus samples into either the Limnology Center log-in or the NHDES Laboratory Services Login. Jen Drociak will be responsible for inspecting and accepting all supplies and consumables for the dissolved oxygen concentration measurements and water sampling/phosphorus analysis.

Please refer to the existing approved QAPPS for the Volunteer Lake Assessment Program (VLAP) and the Volunteer River Assessment Program (VRAP) for additional information.

## **B9 – Non-direct Measurements**

Historical data from the Manchester Urban Pond Restoration Program Year 2 Report - May 2002 by the Manchester Conservation Commission (2001 Sediment Data) may be used for comparative purposes. This report is attached in Appendix B.

## **B10 – Data Management**

See Section A9 for additional information on Document and record management. See Sections C1, D1 and D2 regarding data review, verification and validation and assessments and response actions for the following items.

### **Sediment Sampling/Analysis**

- Field data will be recorded on field notes and field logs (see Appendix D) by DuBois & King.
- DuBois & King will check field notes and field logs for completeness.
- Chain-Of-Custody will be initiated in the field by DuBois & King.
- Chain-Of-Custody will be completed at the laboratory by DuBois & King and the sediment analysis laboratory (Endyne, Inc.).
- DuBois & King will copy all field documents for back up. See Section A9 for further details on storage.
- Field reports and laboratory data are submitted to the DuBois & King Project Manager (Jeffrey Tucker). The DuBois & King Project Manager shall review all field reports for completeness by making sure all entries on the data sheets are filled out. The DuBois & King Project manager will

make sure that any questionable entries are verified by speaking to the sampling team or reviewing the field logbooks, and noting any unusual or anomalous data in the project files.

- DuBois & King will incorporate field data into a spreadsheet for the project. Information such as sample ID, date and time of collection, and other field data will be recorded. This step will create a record for each sample prior to receipt of the analytical data from the laboratory and will be the initial step of setting up a sample tracking system. The sample tracking system will allow the status of each sample to be identified during the data generation process. The DuBois & King Project Manager (Jeffrey Tucker) will oversee the QA/QC check of this spreadsheet to verify it corresponds with the field reports and laboratory data that is to be verified as discussed above. Only DuBois & King Information Technology (IT) employees and employees working on this project will be allowed access to this spreadsheet. See Section A9 for details on data storage.
- Full laboratory data packages will be supplied by the sediment analysis laboratory (Endyne, Inc.) for the PAHs, metals and other analyses in hard copy and in a scanned electronic media (Adobe® Acrobat® .pdf) to DuBois & King.
- DuBois & King will incorporate the laboratory data into the tracking system spreadsheet set up as described above.
- Field and laboratory data and findings will be compiled and reported by DuBois & King to the City of Manchester and NHDES for analysis to determine whether additional remedial investigation or corrective action requirements are necessary. The data will be submitted per final report. The sediment data will also be included as part of the overall report for the project.

#### **Photographic Documentation of Project**

- The City of Manchester Parks Recreation & Cemetery Department will download photographs.
- The City of Manchester Parks Recreation & Cemetery Department will print photographs to create paper hard copy records.
- The City of Manchester Parks Recreation & Cemetery Department will add captions to photographs for descriptive purposes.
- The City of Manchester Parks Recreation & Cemetery Department will generate a back-up electronic file for all photographs. See Section A9 for further discussion data storage.
- The City of Manchester Parks Recreation & Cemetery Department will print all pictures with captions. See Section A9 for further discussion data storage.

#### **Dissolved Oxygen Concentration Measurements & Water Sampling/Phosphorus Analysis**

Water quality sampling will be done under the direction of the NHDES in accordance with existing approved QAPPS for the Volunteer Lake Assessment Program (VLAP) and the Volunteer River Assessment Program (VRAP). Data management protocols can be found in those QAPPs.

#### **Biological Community (Fish Assemblages) Assessments And Habitat Assessment**

Biological and habitat monitoring will be done by the NHDES Biomonitoring Program under an existing approved QAPP. Volunteers from Trout Unlimited, the Manchester Fly Fishing Club, and Amoskeag Fishways shall assist with this work. Data management protocols can be found in those QAPPs.

### **C1 – Assessments and Response Actions**

Approved project-specific QAPPs and approved generic program QAPPs must be reviewed annually by the Lead Organization, and this annual review must be documented in a letter to the appropriate approval authority. If minor revisions are made to the approved QAPP that do not require approval (i.e., revisions that do not impact data quality), then these minor revisions must be documented in either a letter that outlines the revisions or in a revised QAPP document. Likewise, if minor revisions are made to the approved QAPP that do require re-approval, then these minor revisions must be documented in either a

letter that outlines the revisions or in a revised QAPP document and must be submitted for review and re-approval. If extensive revisions are necessary (i.e., greater than 10 pages and/or there are multiple impacts on data quality) requiring re-approval, then a revised QAPP document must be submitted for review and re-approval.” (EPA QAPP compendium, section 7.1, October, 1999).

#### **Sediment Sampling/Analysis**

Following the one proposed round of field sampling, the DuBois & King Quality Assurance Officer (Jeffrey Tucker) will assess whether field protocols of this QAPP have been followed. If there are any deviations, he will coordinate with NHDES and the City of Manchester Parks Recreation & Cemetery Department staff to identify corrective actions.

The sediment analysis laboratory (Endyne, Inc.) conducts internal audits on a regular basis as described in the Quality Systems Manual and SOPs for Endyne, Inc. attached in Appendices E and G.

#### **Photographic Documentation of Project**

Following each of the three (3) rounds of photographs, the City of Manchester Parks Recreation & Cemetery Department will assess whether photographic documentation has been completed as described in this QAPP and shall direct additional photographic documentation if needed.

#### **Dissolved Oxygen Concentration Measurements & Water Sampling/Phosphorus Analysis**

Water quality sampling will be done under the direction of the NHDES in accordance with existing approved QAPPS for the Volunteer Lake Assessment Program (VLAP) and the Volunteer River Assessment Program (VRAP). Assessment and response actions can be found in those QAPPS.

#### **Biological Community (Fish Assemblages) Assessments And Habitat Assessment**

Biological and habitat monitoring will be done by the NHDES Biomonitoring Program under an existing approved QAPP. Volunteers from Trout Unlimited, the Manchester Fly Fishing Club, and Amoskeag Fishways shall assist with this work. Assessment and response actions can be found in those QAPPS.

## **C2 – Reports to Management**

As part of the quarterly reports required by the 319 Grant Agreement, the City of Manchester Parks, Recreation & Cemetery Department will summarize data collection and analysis activities collected during each quarter of the project. These quarterly reports shall be submitted to NHDES.

The sections below describe the reports that will be prepared for each round of sampling by all groups involved. In addition to being distributed as indicated below, these individual reports will be included as Appendices in a Comprehensive Final Report for the project. The City of Manchester Parks, Recreation & Cemetery Department will prepare and submit this Comprehensive Final Report as a condition of the 319 Grant Agreement at the conclusion of the project.

#### **Sediment Sampling/Analysis**

DuBois & King will prepare a sediment analysis report that summarizes field activities, presents the analytical results, compares the results to the project's screening levels, and recommends further analysis (if applicable).

The final sediment and analysis report will include a summary of the activities completed including:

- actions that have been taken toward achieving project scope
- number and location of cores collected
- number of cores processed

- number of samples generated
- status of laboratory analysis
- all results of sampling, tests, and all other verified or validated data received or generated in the implementation of the work required
- identify any unresolved or uncompleted activities
- description of any outstanding issues and how they are being resolved

Electronic and paper hard copies of all project files and reports shall be given to the City of Manchester and NHDES as well for their records.

#### **Photographic Documentation of Project**

The City of Manchester Parks Recreation & Cemetery Department will prepare a brief photographic report following each of the three (3) rounds of photographic documentation (pre-project implementation, construction, and post-project implementation). The report will include a site plan with photograph stations identified that indicates where and in what direction the photographs were taken and a copy of each photograph with the proper descriptive caption. The City of Manchester Parks Recreation & Cemetery Department will provide hard copy paper and electronic versions of the reports to NHDES and DuBois & King for their review and records.

#### **Dissolved Oxygen Concentration Measurements & Water Sampling/Phosphorus Analysis**

Water quality sampling will be done under the direction of the NHDES in accordance with existing approved QAPPS for the Volunteer Lake Assessment Program (VLAP) and the Volunteer River Assessment Program (VRAP). Standard reporting procedures can be found in those QAPPs.

NHDES Watershed Bureau via the NHDES Environmental Monitoring Database will generate end of year reports. The Data Summary Report will fully document the work and will include a summary of the work performed, a tabulation of results, field notes, processing data, chain-of-custody forms, and copies of the laboratory reports. This report will be distributed to the City of Manchester Parks Recreation & Cemetery Department, the Manchester Conservation Commission, and DuBois & King.

#### **Biological Community (Fish Assemblages) Assessments And Habitat Assessment**

Biological and habitat monitoring will be done by the NHDES Biomonitoring Program under an existing approved QAPP. Volunteers from Trout Unlimited, the Manchester Fly Fishing Club, and Amoskeag Fishways shall assist with this work. Standard reporting procedures can be found in that QAPP.

All data generated by Trout Unlimited, the Manchester Fly Fishing Club, and Amoskeag Fishways will be processed by the NHDES Biomonitoring Program in-house. Once this data is processed, it will be entered into the NHDES Environmental Database. This NHDES Environmental Database will be the official location this data will be stored and checked for Quality Control. This data will then be made available to the public via the Internet.

No specific year-end reports are typically generated by the NHDES Biomonitoring Program. Steve Landry, Overall NHDES Maxwell Pond Dam Removal/Black Brook Restoration Project Coordinator, will therefore request the NHDES Biomonitoring Program Director (David Neils), have a special report produced dealing with the Maxwell Pond Dam Removal/Black Brook Restoration Project. The Data Summary Report prepared after the end of field activities will fully document the work and will include a summary of the work performed, a tabulation of results, field notes, processing data, and copies of other applicable reports. The recipients of this report shall be the NHDES Watershed Bureau, the City of Manchester Parks Recreation & Cemetery Department, and DuBois & King.

## **D1 – Data Review, Verification and Validation**

### **Sediment Sampling/Analysis**

Data review, verification and validation in the sediment laboratory will be handled as described in the Quality Systems Manual and SOPs for Endyne, Inc. attached in Appendices E and G. Samples containing less than 30 percent solids will be qualified.

The DuBois & King Project Manager (Jeff Tucker) will review all sediment data results and evaluate QC requirements for usability in obtaining the stated objectives of the project based on the criteria established in Sections A5 and A6 and the QC criteria in Section B5. The completeness, transcription errors and compliance with procedures will be evaluated by comparison of tabulated results to what has been proposed in the original project proposal and this QAPP. The specific activities include the generation of data. Omissions of data in spreadsheets will trigger a search of raw datasheets for missing data or possibly reanalysis of the questionable sample, if possible. If reanalysis is not possible or if data remain missing, invalid or otherwise affected entries will not be incorporated into the useable data set.

### **Photographic Documentation of Project**

The City of Manchester Parks Recreation & Cemetery Department (Overall) Project Manager (Charles DePrima) and/or (Overall) Project Co-Manager (Jonathan O-Rourke) will evaluate the photographic documentation for completeness and compliance with this QAPP.

### **Dissolved Oxygen Concentration Measurements & Water Sampling/Phosphorus Analysis**

Water quality sampling will be done under the direction of the NHDES in accordance with existing approved QAPPS for the Volunteer Lake Assessment Program (VLAP) and the Volunteer River Assessment Program (VRAP). Data Review, Verification and Validation procedures can be found in those QAPPs.

### **Biological Community (Fish Assemblages) Assessments And Habitat Assessment**

Biological and habitat monitoring will be done by the NHDES Biomonitoring Program under an existing approved QAPP. Volunteers from Trout Unlimited, the Manchester Fly Fishing Club, and Amoskeag Fishways shall assist with this work. Data Review, Verification and Validation procedures can be found in those QAPPs.

## **D2 – Verification and Validation Procedures**

### **Sediment Sampling/Analysis**

Field reports and laboratory data are submitted to the DuBois & King Project Manager (Jeffrey Tucker). The DuBois & King Project Manager shall review all field reports for completeness by making sure all entries on the data sheets are filled out. The DuBois & King Project manager will make sure that any questionable entries are verified by speaking to the sampling team or reviewing the field logbooks, and noting any unusual or anomalous data in the project files.

Data verification and validation procedures in the sediment laboratory will be handled as described in the Quality Systems Manual and SOPs for Endyne, Inc. attached in Appendices E and G.

The DuBois & King Project Manager will review the lab data by looking at the lab narrative and the quality control sample results to see if the data are qualified. Any decisions made regarding the usability of the data will be left to the DuBois & King Project Manager, however the DuBois & King Project Manager may consult with project personnel, the City of Manchester Parks Recreation & Cemetery Department NHDES QA staff, or with personnel from EPA-NE.

**Photographic Documentation of Project**

The City of Manchester Parks Recreation & Cemetery Department will compare the obtained photographs with those prescribed in the Photographic Documentation Plan (see Section B1) and document any missing or possible inaccurate photographs or accompanying information (e.g., captions, dates, etc.). The Project manager will make sure that any questionable photographic documentation are verified by speaking to the photographic team or reviewing the field logbooks, and noting any unusual or anomalous documentation in the project files. Any decisions made regarding the usability of the photographic documentation will be left to the Project Manager, however the Project Manager may consult with project personnel, the City of Manchester Parks Recreation & Cemetery Department NHDES QA staff, or with personnel from EPA-NE.

**Dissolved Oxygen Concentration Measurements & Water Sampling/Phosphorus Analysis**

Water quality sampling will be done under the direction of the NHDES in accordance with existing approved QAPPS for the Volunteer Lake Assessment Program (VLAP) and the Volunteer River Assessment Program (VRAP). Verification and validation procedures can be found in those QAPPS.

**Biological Community (Fish Assemblages) Assessments And Habitat Assessment**

Biological and habitat monitoring will be done by the NHDES Biomonitoring Program under an existing approved QAPP. Volunteers from Trout Unlimited, the Manchester Fly Fishing Club, and Amoskeag Fishways shall assist with this work. Verification and validation procedures can be found in that QAPP.

**D3 – Reconciliation with User Requirements****Sediment Sampling/Analysis**

If the project objectives from Section A7 are met, the user requirements have been met. If the project objectives have not been met, corrective action as discussed in D2 will be established by the DuBois & King Project Manager (Jeffrey Tucker) in consultation with NHDES and the City of Manchester Parks Recreation & Cemetery Department.

The sediment analysis laboratory will handle reconciliation and user requirements as outlined in the Quality Systems Manual and SOPs for Endyne, Inc. attached in Appendices E and G.

**Photographic Documentation of Project**

If the data verification and review described in Sections D1 and D2 reveals errors, omissions, or non-compliance in the photographic documentation, the Project Manager (Charles DePrima) and/or Project Co-Manager (Jonathan O-Rourke) will decide whether additional photographic documentation is needed prior to the next scheduled round. Regardless, the Project Manager or Co-Project Manager will implement corrective action in the form of renewed training and increased direction to staff to improve data collection and quality.

**Dissolved Oxygen Concentration Measurements & Water Sampling/Phosphorus Analysis**

Water quality sampling will be done under the direction of the NHDES in accordance with existing approved QAPPS for the Volunteer Lake Assessment Program (VLAP) and the Volunteer River Assessment Program (VRAP). Reconciliation with user requirements is covered in those QAPPS.

**Biological Community (Fish Assemblages) Assessments And Habitat Assessment**

Biological and habitat monitoring will be done by the NHDES Biomonitoring Program under an existing approved QAPP. Volunteers from Trout Unlimited, the Manchester Fly Fishing Club, and Amoskeag Fishways shall assist with this work. Reconciliation with user requirements is covered in those QAPPS.

## References

1. Certificate and Analyte List from NH ELAP for Endyne, Inc.
2. Endyne 2007 Quality Control Data.
3. Endyne Statement of Qualifications ([www.endynelabs.com/statqual.htm](http://www.endynelabs.com/statqual.htm)) (3/5/2007).
4. Environmental Laboratory Accreditation Program & NELAP, NHDES ELAP web site.
5. Generic Quality Assurance Project Plan For New Hampshire Biomonitoring Program, by NHDES (December, 2002).
6. ICP SOP EPA Method 6010B (April 4, 2005).
7. MacDonald et al., – Archives of Environmental Contamination and Toxicology Vol 39, No. 1: p. 20-31 (June, 2000).
8. Manchester Urban Pond Restoration Program Year 2 Report - May 2002, by Manchester Conservation Commission - Art Grindle, Program Coordinator (2001 Sediment Data).
9. Maxwell Pond Dam Removal/Black Brook Restoration Project Grant Application (1-19-2007).
10. Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual (EPA-823-B-01-002).
11. Mercury In Solid Or Semisolid Waste Method SW 7471A SOP (September 15, 2006).
12. NHDES Volunteer Lake Assessment Program Generic QAPP (May 10, 2005).
13. NOAA 1999 – SQuiRT Tables (NOAA Hazmat Report 99-1).
14. Oak Ridge National Laboratory 1997 – Toxicological Benchmarks (ORNL ES/ER/TM-95/R4).
15. Photo Documentation Procedure for Measuring the Success of Restoration Projects and Best Management Practices by NHDES (11/19/02).
16. Quality Systems Manual, by Endyne, Inc. (Effective Date: 9-2-05).
17. Semi-Volatile Organic Contaminants Method EPA 8270C SOP (April 6, 2005).
18. Volatile Organic Compounds Method EPA 8260/8260B SOP (April 7, 2005).
19. Volunteer River Assessment Program Quality Assurance Project Plan (9-9-03).
20. US Environmental Protection Agency 1996 – Ecotox Thresholds (USEPA EPA 540/F-95/038).